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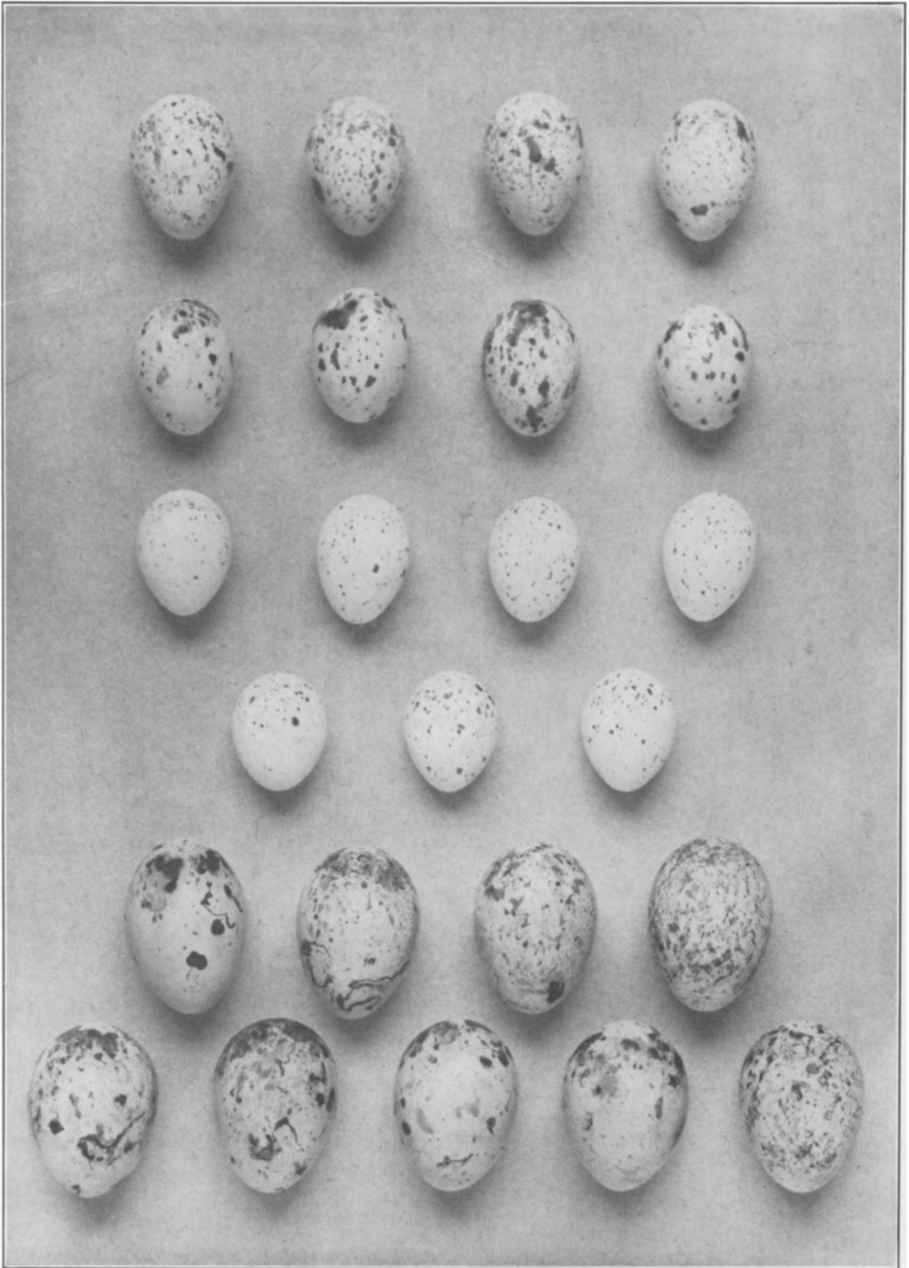
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NATURAL SIZE.

PHOTO. BY L. W. BROWNELL.

BLACK-THROATED BLUE WARBLER (1 AND 2).
NORTHERN PARULA WARBLER (3 AND 4).
WHITE-THROATED SPARROW (5 AND 6).
SUCCESSIVE SETS FROM THE SAME PAIRS OF BIRDS.

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A STUDY OF SUBSEQUENT NESTINGS AFTER THE LOSS OF THE FIRST.¹

BY H. MOUSLEY.

Plates XIII-XIV.

It is the byways I imagine in any science we may take up, that really keeps our interest in it alive. Even when out for a walk the main object with most people is to get off the beaten track and wander into the fields and lanes, and so with ornithology, the high-ways after a time become exhausted, and the student turns to the byways wherein he may find some interesting problem the solution of which is not to be found in any text book, but will depend upon his own efforts, and so it transpired that some six years ago whilst wandering down one of these lanes or byways so to speak of ornithology, I came face to face with the following problems, no attempted solution of which I have so far seen in print, viz.:

(1) How many sets of eggs will a bird lay after the loss of the first one.

(2) What time will be occupied in building a new nest and laying another complete set of eggs.

(3) Will the succeeding nests be in similar situations, and construction to the first one, and how far will they be from it.

¹ Read before the Nuttall Ornithological Club, March 5, 1917, by Dr. Chas. W. Townsend for the Author.

(4) Will the eggs in the succeeding sets be alike in markings, shape, size and number, to the first ones.

Now we often take up a subject (and so I did this one) without fully realizing the rocks ahead, for little did I think then that it would take me six years before I could collect even a moderate amount of reliable data to work upon, and even now the first question remains only partly answered, and I doubt if it can be fully and with certainty by any one. After a start had been made, it soon became evident that if my data were to be of any use not only would great care have to be exercised in the selection of the ground, such as small detached pieces of woodland etc., where only one pair of birds of any particular species were domiciled, but I should perforce be obliged to put sentiment on one side for the time being, and take the sets one after the other as they were laid. Lucky the botanist who has none of these distressing things to contend with in the pursuit of his favorite study and consequently never incurs the displeasure of Mrs. Grundy. Even now I can hear that august person saying "Monstrum horrendum," but there, I have not much regard for Mrs. Grundy, for after this article has appeared in print I shall, no doubt, later on meet the one arrayed in a beautiful hat, trimmed with an aigrette plume or bird of paradise, whilst the other will be boasting of the fifty brace of birds he bagged the day before, without the slightest compunction, whereas the taking of my sets caused me considerable distress, which however, is now over as I do not intend to carry my investigations any further along this particular line, as I consider the answers obtained to all but the first question sufficiently convincing to satisfy most people, except perhaps those who are always willing and anxious to push things to extremes, and who would kill hundreds of small birds in their endeavour to prove that they differed in some slight degree from the type, when no doubt a dozen specimens or so would have accomplished the thing equally as well, *i. e.* if there was really anything to accomplish.

However, to return to my subject and the table I have prepared, from which it will be seen that the time covers the years 1911-1916, and that nearly one half of the fourteen birds enumerated belong to the Warbler family. This is merely a coincidence, the family not having been specially selected, as I had to take a suitable case

Species	Year	1st Set taken	2nd Set taken	3rd Set taken	Incubation
Yellow Warbler	1911	June 2	June 16		3 days
Maryland Yellow-throat	1912	June 6	June 15		fresh
Least Flycatcher	1912	June 6	June 16		fresh
Kingbird	1912	June 11	June 24	July 1	fresh, ?
Catbird	1912	June 21	July 2		fresh
Robin	1914	May 16	May 26	June 5	fresh
Chestnut-sided Warbler	1914	June 6	June 15	June 25	fresh.
Prairie Horned Lark	1915	April 14	April 23		fresh
Downy Woodpecker	1915	May 22	June 9		fresh
Myrtle Warbler	1915	May 27	June 7	June 18	fresh
Veery	1915	June 2	June 12		fresh
Northern Parula Warbler	1915	June 5	June 26		5 days
White-throated Sparrow	1915	June 5	June 18		2 days
Black-throated Blue Warbler	1916	June 19	July 10		5 days

Species	Time between sets	Nests in similar situations	Nests alike in construction	Distance of nests from No. 1	Eggs alike in markings or color
Yellow Warbler	11 days	Yes	Yes	250 yds.	No
Maryland Yellow-throat	9 "	Yes	Yes	30 "	Yes
Least Flycatcher	10 "	Yes	Yes	7 "	Yes
Kingbird	13 "	Yes	Yes	0 " ¹	Yes
	7 ? "	No	No	65 " ²	?
Catbird	11 "	Yes	Yes	268 "	Yes
Robin	10 "			15 "	
	10 "	Yes	Yes	37 "	Yes
Chestnut-sided Warbler	9 "			24 "	
	10 "	Yes	Yes	37 "	Yes
Prairie Horned Lark	9 "	Yes	Yes	60 "	Yes
Downy Woodpecker	18 "	Yes	Yes	110 "	Yes
Myrtle Warbler	11 "			24 "	
	11 "	Yes	Yes	67 "	Yes
Veery	10 "	Yes	Yes	25 "	Yes
Northern Parula Warbler	16 "	Yes	Yes	60 "	Yes
White-throated Sparrow	11 "	Yes	Yes	13 "	Yes
Black-throated Blue Warbler	16 "	Yes	No	90 "	No
average =	11 "		average =	66 "	

¹ Same tree.

² Baltimore Oriole's nest.

Species	Eggs alike in shape	Eggs alike in size	Average size of sets	No. of eggs in each set	Remarks
Yellow Warbler	Yes	Yes	.66×.50	4	
			.67×.51	4	
Maryland Yellow-throat	Yes	Yes	.69×.50	3	
			.69×.50	3	
Least Flycatcher	Yes	Yes	.65×.52	3	
			.64×.52	3	
Kingbird	Yes	No	.91×.68	3	
			.85×.65	3	
	?	?	?	3	
Catbird	Yes	Yes	.90×.70	3	
			.89×.68	3	
Robin	Yes	No	1.19×.78	4	
			1.10×.76	4	
			1.09×.76	4	
Chestnut-sided Warbler	Yes	Yes	.63×.49	4	
			.65×.49	4	
			.65×.50	3	
Prairie Horned Lark	Yes	No	.82×.58	4	
			.78×.58	4	
Downy Woodpecker	Yes	Yes	.77×.60	5	
			.77×.59	5	
Myrtle Warbler	Yes	Yes	.69×.53	4	
			.70×.52	4	
			.70×.53	5	
Veery	Yes	Yes	.84×.64	4	
			.84×.65	4	
Northern Parula Warbler	No	No	.64×.47	4	only nests
			.61×.47	3	ever found
White-throated Sparrow	Yes	Yes	.87×.62	4	Uncommon
			.87×.63	5	sets
Black-throated Blue Warbler	No	No	.70×.51	4	only nests
			.66×.50	4	ever found

whenever it presented itself, and incidentally the Mniotiltidæ seem to have predominated. The headings to the various columns sufficiently explain them I think, but I propose to give some details concerning each bird enumerated, following the order in which they appear in the table.

Commencing with the Yellow Warbler (*Dendroica aestiva aestiva*), I may say that it is of very erratic appearance at Hatley, as may be judged by reference to my 'Birds of Hatley,' Auk, Vol. 33, 1916, p. 178, and the pair now under notice were the only ones seen in 1911. The first nest was found in a little patch of alders bordering a small stream in front of my house, and was placed in the forks of one of these saplings five feet above the ground, the second being in a similar situation only 150 yards further up the stream. As regards the sets of eggs they form one of the few exceptions where neither are altogether alike in ground color and markings, the former in the first set being of a greenish white with bold markings forming a wreath at the larger end, whilst that in the second is of a bluish white, with much less pronounced spots and wreath, the size however, being about the same in both cases. It was not before incubation had been in progress I estimated three days, that I found the second set, although the birds were observed in the neighborhood off and on all the time, but disappeared entirely and were never seen again after the taking of this last set. Notwithstanding the somewhat marked difference in the eggs which consisted of four in each case (the nests being exactly alike in construction) everything else is in favor of, and I have no misgivings in my own mind but that they belonged to the same pair of birds.

The site of the Maryland Yellow-throats' (*Geothlypis trichas trichas*) nests, was on the borders of "the marsh" so often mentioned in my 'Birds of Hatley,' the first one being on the ground at the foot of a very small nut shoot, amongst long grass, whilst the second was hidden in similar material at the foot of a small bramble. The eggs, three in number in each case, are all practically free from spots at their smaller end, whilst being zoned at the larger, and so alike are they in shape, size and markings that when mixed up, one cannot with certainty separate the two sets. Here again after the taking of the second set the birds were never seen again, but in the following year my youngest son, whilst gathering wild fruit, came upon another nest (and set of eggs far advanced in incubation and which hatched out two days later) only a few yards from the site of the first one of the year previous, and I was thus luckily enabled to see and note that these eggs were almost counterparts of the others. I mention this case of the birds returning to the old site, as well as

some others later on, for a particular reason, which will appear hereafter.

The account of the Least Flycatcher (*Empidonax minimus*) presents nothing unusual, both nests being placed in the forks of apple trees (only seven yards apart) in an orchard near my house, the eggs in each case being identical in shape, size and number. The birds were not seen again after the second set was taken, but the orchard has been occupied by a pair (the same I feel sure) every year since, and one of the two trees was built in again on one occasion. Our next case the Kingbird (*Tyrannus tyrannus*) is a peculiar one in many ways. The first nest was in an apple tree ten feet above the ground, and after the first set was taken the birds remained near the site in an undecided kind of way, often perching in the tree and inspecting the nest. Eventually they made up their minds and did a little repairing (made necessary owing to the raids of other birds upon it for building material) and then laid another set of eggs. Upon these being taken they selected an old Baltimore Oriole's nest in a somewhat tall maple in front of my house, where I could not reach them. Here in this strange abode they laid a third set of eggs and brought up a brood. The following year they were back again in the apple tree, and repaired the old nest, and I did not molest them. The markings on the second set are similar to the first, being generally distributed all over the eggs, rather smaller however in size and not quite so abundant at the larger end as in the first set. The shape is similar but much smaller, in fact they are the smallest set of Kingbirds I have found so far, the number however in each case was the same viz. three, and as I only saw three young birds, I have assumed that the third set contained the same number also. I have taken seven days as the time between the second and third sets (there being of course no nest to build only to repair) the female commencing to incubate on that day as near as I could tell.

The Catbird's (*Dumetella carolinensis*) first nest was in a little wood adjoining "the marsh" and was placed in a nut bush overhanging the water. When the first set of eggs was taken they forsook the wood and built a second nest in a somewhat exposed thorn bush 268 yards (the greatest distance recorded) further along the marsh on the same side, but away from the water's edge.

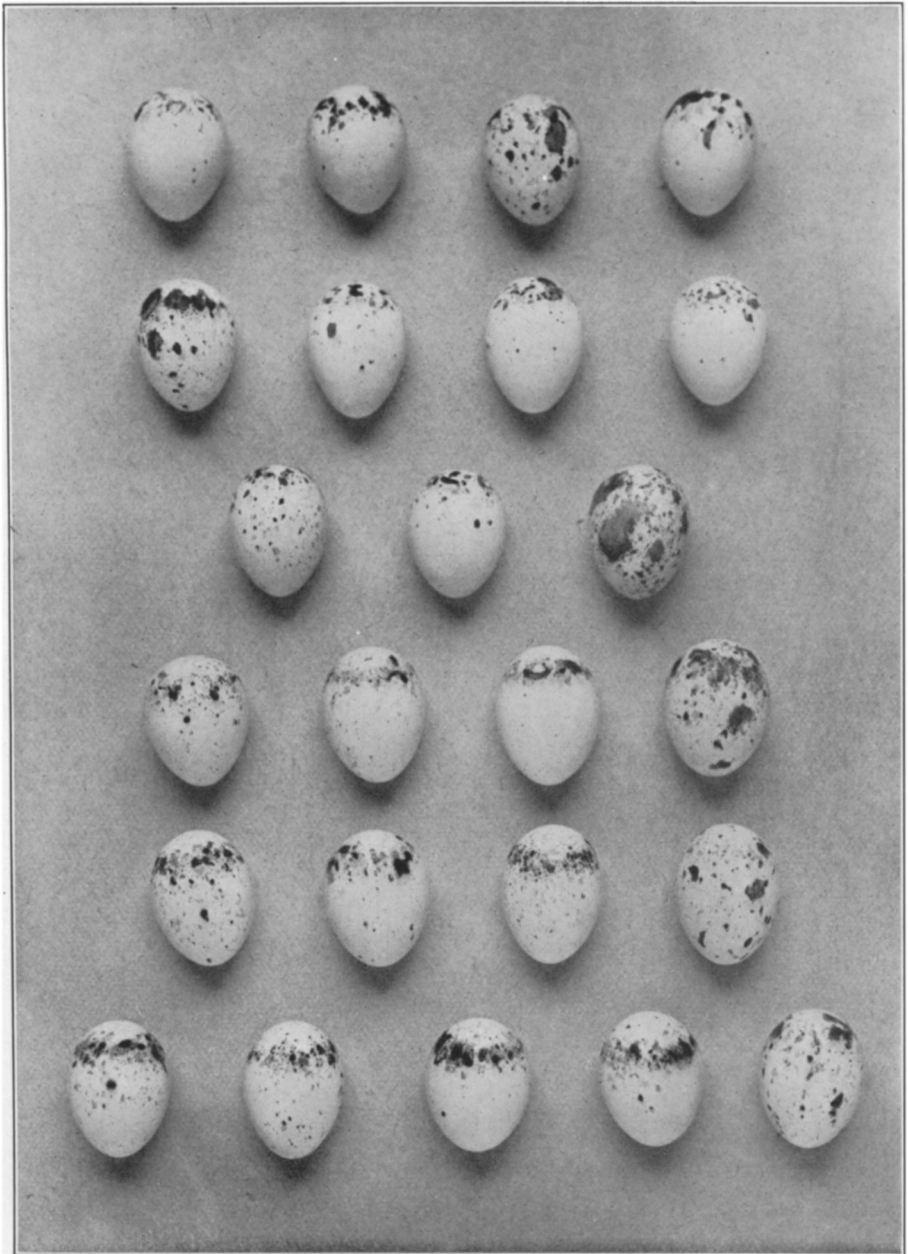
The eggs in each set were three and practically alike in every respect. The birds could not be traced again after the taking of the second set, but the wood has been occupied again more than once, and the very same thorn bush was built in the following year. The nests of the Robins (*Planesticus migratorius migratorius*) were also situated in the little wood just mentioned above, and all three were placed on the fence rails bordering the same. The first set was a large pear-shaped one, being the largest in point of size that I have found so far. The succeeding ones were similar in shape but dropped down a good deal in point of length, and all three contained four eggs. After the taking of the last set, the birds could not be found again. They were certainly the only pair of Robins domiciled at the time in the wood.

The Chestnut-sided Warbler (*Dendroica pensylvanica*) is the next one on the list, and is interesting in many ways, if only for the reason that it was the first time I had come across a nest or even noticed the species here, the only others seen that year being a pair at Ayers Cliff some six miles away. The site of the three nests was on the roadside, the first being in the forks of a small nut bush three feet above the ground, the second being in a similar situation 24 yards to the south on the opposite side of the road, whilst the third was on the same side as the first, in a raspberry cane, 37 yards to the north, all three nests thus being within a space of 61 yards. They were identical in construction, one peculiarity about them however being that fine fir twigs were partly used in their outward construction, a material I have not noticed in subsequent ones found. The eggs are handsomely and somewhat boldly marked and wreathed at their larger end, the smaller or pointed end being generally free from spots with one exception, that of the last or eleventh egg laid, which is not only the largest of the series, but is more heavily blotched at the larger end, as well as finely speckled all over the smaller or pointed end than any of the others. If this egg is removed the remaining ten are practically counterparts of one another, although the average size of each set varies a little, the first curiously enough being the smallest of the three, whilst the third is the largest in this respect, but the smallest in number of eggs (which one would naturally expect in a third set) there being only three instead of four as in the other

two. After the taking of the third set the birds were not seen again, but in the following year a pair were noticed in the vicinity, but I failed to find their nest. The next year (1916) however, they were there again, and this time I found the nest and set of eggs (heavily incubated) which were very similar to those of 1914.

The Prairie Horned Lark (*Otocoris alpestris praticola*) is another interesting species, and the two nests under notice together with some others have been fully dealt with in my paper on the breeding of the species at Hatley (see Auk, Vol. 33, 1916, pp. 281-286). They were both on the ground in a large field near my house and were exactly like one another in construction, both having the "paving" peculiarity, to draw attention to which the above article was specially written. The eggs were all alike as regards shape and markings, which latter consisted of very minute specks over the entire surface, with a somewhat pronounced zone at the larger end, the second set however being smaller than the first as regards dimensions, but both containing an equal number of eggs viz.: four. After taking the second set the birds forsook this particular field (much to my disappointment as I had hoped to still further corroborate the period at which the "paving" to the nests is added) but some were seen about the district until June 22. The following year (1916) however another nest and set of eggs was found in this same field by my youngest son on May 30, this nest also exhibiting the aforementioned peculiarity, there being no less than 46 small pieces of cowchips, stones and lichen, making up the "paving" or banking, which fortunately with the nest had not been disturbed in any way, although the eggs had been abstracted by someone, before I had an opportunity of seeing them a few days after.

The Downy Woodpecker (*Dryobates pubescens medianus*) presents nothing specially interesting, the first nest being in a dead elm tree eighteen feet above the ground, the entrance hole being one inch in diameter, the extreme depth eight inches and the average width two and one half inches, the second one being almost identical, but only six feet above the ground, in a dead poplar stub. The eggs in both cases are all practically alike, the second set being just a shade less in thickness. No further nest could be located after the second set was taken, but the elm tree was made use of again the following year, a new hole being excavated on the oppo-



NATURAL SIZE.

PHOTO. BY L. W. BROWNELL.

CHESTNUT-SIDED WARBLER (1, 2 AND 3).

MYRTLE WARBLER (4, 5 AND 6).

SUCCESSIVE SETS FROM THE SAME PAIRS OF BIRDS.

site side of the tree, only a little lower down, but the birds were not disturbed.

The Myrtle Warbler (*Dendroica coronata*) coming next, forms a specially interesting case. The species is a rare breeder here and I have only found the nest of one other pair of birds so far, and that was some distance from the present site, which was on the borders of a somewhat extensive wood. Here in a small fir, three feet above the ground the first nest was found, only four yards away from the site of the previous year's one, which contained four young birds when I found it. The second one being 24 yards to the south of it, also in a fir and three feet up, whilst the third was 64 yards likewise to the south and in a similar situation only six feet up, all three nests being close against the trunk, and fac-similies of one another as regards construction. The sets present many interesting features, the third one being not only the largest as regards dimensions, but also as regards the number of eggs, there being five instead of four as in the other two cases, a most unusual thing and quite contrary to what one would expect, although curiously enough my friend Mr. L. M. Terrill, writing in the 'Ottawa Naturalist' for November 1904, mentions the fact of his having come across a second set of this same species, in which the number of eggs was five as against four in the first set, the markings however being the same in both cases. All the eggs are zoned at the larger end, the rest of the surface being pretty free from markings of any kind, with the exception of one egg in each set (the last one laid as I was careful to note) which not content with being lightly blotched all over, is also the largest egg in each set, just as was the case in the last one laid of the third set of the Chestnut-sided Warbler. It is an interesting and curious fact and one which I am constantly coming across that the last egg laid of a set, often has some peculiarity about it, being different from the rest as regards either the ground color, markings, or size. After taking the third set the birds were not noticed again, but in the following year (1916), I came across a male in this same locality on June 21 and again on July 9, on which latter date it had food in its beak, so I concluded there were young about, but I failed to find any nest. The Veery (*Hylocichla fuscescens fuscescens*) is not plentiful here, so when a nest was found in a little willow swamp it seemed a suitable

case, and the first set was taken, the second being found ten days later only 25 yards away from the first. Both nests were on the ground in tufts of grass in the center of little hummocks, and each contained a set of four eggs, identical in color, shape and size. After the loss of their second set the birds forsook the wood, and were not seen again.

We now come to the Northern Parula Warbler (*Compsothlypis americana usneæ*) a rare summer as well as transient visitor here, in fact I have only seen four examples so far, the present pair in the summer of 1915, and an adult female and immature in the fall of 1916. The two exquisite little nests were located in a somewhat extensive wood where in a limited area long streamers of usnea lichen hang from a few fir trees, and it was in these that they were found, the first 35 feet, and the second 25 feet above the ground, both pensive and composed entirely of usnea lichen, and lined with a little plant down, the first containing a set of four pear-shaped eggs, and the second, one of three, the latter not only being less in number, but also smaller in size, the spots however being rather more numerous, a little larger and forming a more decided zone at the larger end. They were also incubated about five days as near as I could tell, which would allow an interval of sixteen days between the sets, this time fitting in very well with that occupied in building the first nest and laying the four eggs, which was seventeen days, as I was fortunate enough in observing the birds on the day, or day after, the nest was commenced. After the second set was taken they disappeared and I never saw them again, nor did they return to the locality the following year.

The first set of the next species, the White-throated Sparrow (*Zonotrichia albicollis*), was found very close to the site of the first nest of the Northern Parula Warbler, and from its surroundings did not seem to offer a very good case, in fact I should not have taken the set, had it not been for the large size and exceptional beauty of the eggs, the ground color of which, especially when fresh, being of a pronounced greenish blue, heavily blotched with rufous brown and black scrawling, the latter of a pronounced type for this species, in fact more like that of a Red-winged Blackbird, whilst the size is beyond the average. I consider this by far the rarest type in White-throated Sparrow's eggs. After the taking of

this set, I visited the locality on many occasions in the hope of securing another set, but it was not until June 18 that I was fortunate in flushing the female off another (which I estimated was about two days incubated) only thirteen yards from the site of the first. These were counterparts of the first, just a shade thicker, and breaking the general rule by being five in number, instead of four as in the first set. Another interesting feature (already remarked upon) is that one egg in each set (I can only positively say it was the last one laid in the first case, as incubation had commenced as already mentioned in the other before I found it) differs from the others, the markings being much smaller and all over the surface with no pronounced blotches or scrawling of any kind. After the taking of the second set, I was unable to locate another nor did I come across the birds in the neighborhood again.

We now come to the last, but by no means the least interesting example in the table, that of the Black-throated Blue Warbler (*Dendroica caerulescens caerulescens*) and one which I was at first uncertain whether to include or not, on account of the great difference in the size and construction of the nests, as well as in the shape, size and markings of the eggs, but after a careful weighing of the pros and cons of the case, I have come to the conclusion that I was really watching the same pair of birds and have therefore included them. The first nest was placed in the forks of a small maple sapling three feet above the ground, the second being in a similar position but only fifteen inches up, and ninety yards east from the site of the first, the outside depth of which was $4\frac{3}{4}$ inches, and was composed for the upper part of woven cedar or grape vine bark, whilst the lower portion was of loose white birch bark, the lining consisting of slender rootlets and some hair. The second was only $2\frac{1}{2}$ inches in depth and was composed almost entirely of rotten or pithy wood (so characteristic of the species) held together by fibrous materials, and lined with fine black rootlets and black and white hair. The first set of eggs was pear shaped and minutely, spotted, whilst the second were more oblong and boldly marked the thickness however of each being practically the same, the difference arising in the length as will be seen from the table, and in many ways they greatly resemble the two sets of the Northern Parula Warbler especially in shape, the first in both cases being

pear shaped, whilst the second are shorter and oblong, facts I had not noticed previous to the preparation of this paper. After taking the second set the birds were not seen again, nor was any other nest found in the locality, even when searching after all the leaves were off the trees.

It only now remains to sum up the evidence and arrive at the answers to our questions, to do which I must ask my readers in the case of the first one, to assume for the moment that the second or third set of eggs (as the case may be) laid by the birds were the last ones for that season. This being so, the table gives us the following results, viz.:

(1) That 70% of the birds laid one set of eggs only after the loss of the first one, the balance or remaining 30% laying two.

(2) That the average time occupied in building a new nest and laying another complete set of eggs is eleven days.

(3) The evidence in this case all points to the fact of the second or third nest being in a similar situation to the first one, the average distance from it being sixty-six yards.

(4) Here likewise the evidence is all in favor of the eggs in succeeding sets being of the same color, markings and shape as the first ones, but as regards size 57% only appear to be the same in this respect, the remaining 43% differing, and in the matter of numbers 70% of the sets contain the same as the first, whilst the balance or 30% differ, this difference apparently being about equal, half consisting of more, and half of less than the original set.

Now if it were possible that the answer arrived at to our first question, "Might be the be-all and the end all; here," then we'd jump, not the life to come as Macbeth says, but the suppositions to come, for suppose these second or third sets as the case may be, are not the final efforts of the birds at reproduction, what then? Why, so far as I can see no satisfactory answer will ever be forthcoming, for should the birds after leaving the site of their second or third ventures, betake themselves to a fresh locality say a quarter of a mile or more away, how could I or anyone else be able to locate them again, and even if it were possible to do so, and we could secure that set also, they might move off again, and so the thing would go on ad infinitum, except for the reason that we know in the case of wild birds they only lay at a particular season of the year,

but for just how long that season lasts or the reproductive faculties of the birds remain active I am unable to say. Perhaps doctors from their special training may be able to throw some further light on the subject, in the meantime I have formed an opinion of my own (perhaps erroneously) that when birds forsake the vicinity of the nesting site after the loss of their second or third set of eggs, they do so because the power or natural instinct of reproduction has reached its limit, and is over for that particular year. In support of this theory, I have constantly referred to the fact of so many of the birds returning the following year to the old nesting site, and in the case of the Kingbird, Downy Woodpecker and Catbird, actually occupying the same trees and bush again. Now is it reasonable to suppose that they would do this, if after deserting the site the previous year, they had found a fresh one, and brought up a brood? Surely they would have returned to that site with its pleasant associations, rather than to the one with its unpleasant recollections.

In conclusion it seems to me that the more and more we go into these bird problems, the more is the fact brought home to us of the very little we really know concerning them, and at best our solutions in most cases can only be approximate ones after all.